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Photooxidation of skin cells with titanium oxide systems excited with visible light

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Abstract

The interest for nanoparticles increased in the last few years thanks to their unique proprieties and wide use. Although, there are some concerns about the exposure to these nanoparticles because, in certain quantities, can be toxic. In the current study, the effects of graphene nanoparticles doped with titanium dioxide (TiO_2) and silver (Ag) or TiO_2 and copper (Cu) were identified on two human cell lines, A375 and HaCaT, in the absence and presence of visible light. Cytotoxicity and oxidative stress were investigated in the two cell lines with the help of three assays: testing cell viability, measuring the quantity of lactate dehydrogenase (LDH) released and the level of nitric oxide (NO). More precise, the two cell lines were treated with TiO_2/Ag/TRGO and TiO_2/ Cu/TRGO at five different concentration (0.01-1 mg/mL) and incubated for 24 hours in the absence or presence of visible light; after the treatment, three specific assays were made. The findings of this research proved that the toxicity induced by the nanoparticles, in the absence or presence of visible light, damaged the A375 cell line much more compared to the HaCaT cell line. In addition, the results also showed that the treatment TiO_2/Ag/TRGO at high concentrations had the most aggressive effect. In conclusion, this study proved the antitumoral effect of nanoparticles doped with TiO_2/Ag or TiO_2/Cu and opened an opportunity for potential treatments of various diseases using photooxidation. However, due to the fact that the nanoparticles used in this study are known to be present in many everyday products that could come in contact with the human skin, further studies are recommended to be made regarding the toxicity of these nanoparticles on the HaCaT cell line.

Keywords: A375; cytotoxicity; graphene; HaCaT; nanoparticles.

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